NON-DESTRUCTIVE SAMPLING OF LIVE BROILERS FOR CAMPYLOBACTER

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SUMMARY

This study evaluated non-destructive sampling methods (*i.e.*, fecal droppings, cecal droppings, and cloacal swabs) to monitor the presence of *Campylobacter* spp. in broiler chickens on four commercial broiler chicken farms. Samples were taken throughout an 8 wk growout period to assess the presence of the organism during production. During the entire growout period, 45% of 964 fecal droppings, 58% of 284 cecal droppings, and 41% of 786 cloacal swabs presented as positive for *Campylobacter* spp. This finding indicated that the sampling of cecal droppings was the most sensitive, non-destructive sampling method. This study provides data indicating optimal non-destructive sampling methods for assessing *Campylobacter* spp. and indicates the typical frequency curve for flock colonization.

Key words: *Campylobacter*, colonization, microbiology, sampling
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DESCRIPTION OF PROBLEM

Campylobacter spp. (primarily *C. jejuni*) is a major cause of human gastroenteritis and is epidemiologically linked with handling or consumption of improperly prepared poultry products [1, 2]. The organism colonizes broiler intestinal tracts without apparent harm to animal production [3]. If chickens had reduced levels of *Campylobacter* spp. colonization during production, perhaps the risk for carcass contamination during processing would be reduced.

To meet the goal of reducing levels and/or the incidence of the organism, intervention strategies need to be developed. Before the efficacy of such strategies can be determined, simple and non-destructive sampling techniques should be compared to design optimal interventions. Such a sampling method should, most desirably, not destroy broiler chickens nor disrupt poultry production. This was the goal of the present work.

MATERIALS AND METHODS

SAMPLING

From a population of approximately 20,000 birds at each broiler house, an average of approximately twenty-five cloacal swabs, thirty fecal droppings, and ten cecal droppings were each taken early (between 6:00 and 8:00 a.m.) in the morning from four separate commercial broiler farms at weekly intervals.

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Monitoring took place from late spring into the summer months. These samples were taken through eight weeks, and the birds were processed. The samples were collected onto a cotton tipped swab, immersed in a tube of transport medium [4], and transported on ice to the laboratory within 2 hr.

MICROBIOLOGY

The swabs containing the samples were plated onto Campy-Cefex medium [5] and streaked for colonial isolation. The plates were incubated at 42°C for 24 hr under a microaerobic atmosphere [4]. The plates were examined and characteristic translucent colonies were picked for examination under phase-contrast microscopy for identification as *Campylobacter* spp. [4].

STATISTICAL ANALYSIS

As Table 1 shows, an analysis of variance was performed on the data using SAS [6, 7].

RESULTS AND DISCUSSION

SAMPLE TYPES

A comparison of sample types for determining the presence of *Campylobacter* spp. appears in Table 1. Significant differences [6] were noted for the three sample types taken. The sampling method ($P < .0004$) was found to significantly affect the frequency of *Campylobacter* spp. isolation. The least sensitive sample type for yielding *Campylobacter* spp. was cloacal swabs (41%). The most sensitive sample type was cecal droppings (58%). The cloacal swab sample method was not significantly different from the fecal sample method (45%).

Although the cecal droppings were the most sensitive of the non-destructive samples, the ease in detecting and obtaining these samples made collection more difficult. The sampling time was early in the morning, when the birds typically excrete cecal droppings. Although this sample (which has a dark appearance) can easily be distinguished from fecal droppings (having a lighter appearance), locating cecal droppings can be difficult because of their scarcity. It is very likely that culturing of the cecal organ would be most sensitive of all methods to determine colonization of a poultry flock; however, this destructive sampling also has its limitations.

FREQUENCY CURVES

The three sampling types followed one another closely in their corresponding frequency curves (Figure 1). In these four farms, as well as at numerous other farms not included in this survey, we did not detect the presence of the organism until three weeks of production. Age of the birds was found to significantly affect the frequency of *Campylobacter* spp. isolation ($P < .0001$). There was no significant age x sampling interaction. Using the cecal dropping frequency

TABLE 1. Comparison of sample types for determining the presence of Campylobacter spp.

BIRD AGE (Wk)	SAMPLE TYPE[A]		
	Fecal Droppings	Cloacal Swabs	Cecal Droppings
1	0/20	0/20	0/3
2	1/144	0/146	0/28
3	11/20	5/20	0/3
4	32/180	23/160	9/49
5	9/40	LA[B]	14/20
6	156/200	107/160	58/69
7	91/175	62/120	44/67
8	134/185	125/160	39/45
TOTALS	434/964 (45%)[b]	322/786 (41%)[b]	164/284 (58%)[a]

[A]Number of Campylobacter spp. positive samples per number analyzed. Percentage provided in parentheses.

[B]LA = Laboratory accident

[a,b]Sampling methods with different letters are significantly different from one another (Duncan's).

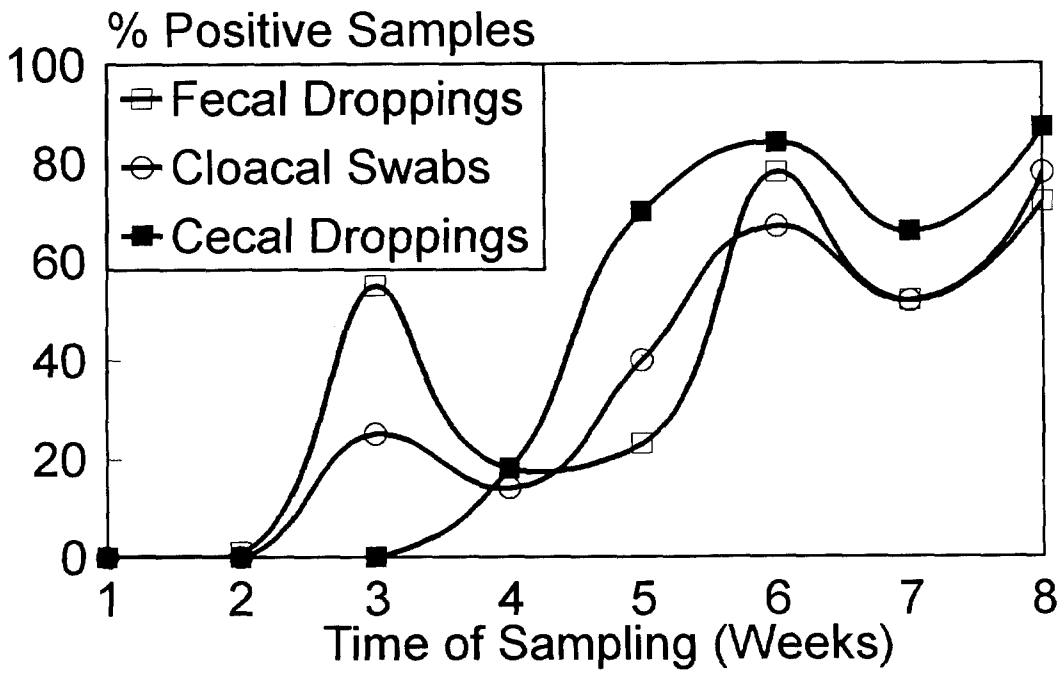

FIGURE 1. Presence of Campylobacter in production (% of selected samples taken weekly through 8 wk of production)

curve, we initially detected the organism during week four. After this detection, the frequency went up dramatically over the next weeks. Incidence remained high through the duration of the 8 wk growout period for these flocks. Occasionally, flocks might pick up a transient colonization caused by a poorly colonizing *Campylobacter* spp. isolate. Colonization may then cease over the next week. This appears to be the case during week three with detection of the organism in both the fecal droppings and cloacal swabs samples. Both of these samples then had diminished incidence during the following week.

It should be noted that the detection of *Campylobacter* spp. directly from the hatchery and during the first two to three weeks of production is almost non-existent. This finding differs markedly from the frequency curve manifested by *Salmonella* spp. This organism can often be detected in hatchery samples, spreading from seeder birds to flock mates, culminating in highest levels of intestinal colonization during the first three to four weeks of production and diminishing thereafter. On the other hand, *Campylobacter* spp. appears to be at its highest incidence rate at the end of broiler production.

CONCLUSIONS AND APPLICATIONS

1. Cecal droppings are the most sensitive non-destructive samples for assessing *Campylobacter* spp. colonization status among broiler chickens.
2. *Campylobacter* spp. is rarely seen in broiler production facilities before the third week of growout. Incidence is highest at the end of broiler growout.

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6. Data were subjected to analysis of variance with sample type and bird age (in weeks) as the independent variables. When differences between the sample types were significant, means were separated using Duncan's multiple range test. Significance is reported by the P values indicated in the text.

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